



Economic Assessment of Energy Efficiency and “10/20” Renewable Energy Goals prepared for the Western Regional Air Partnership

Selected Results

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Strategic Advantage.
Compelling Results.

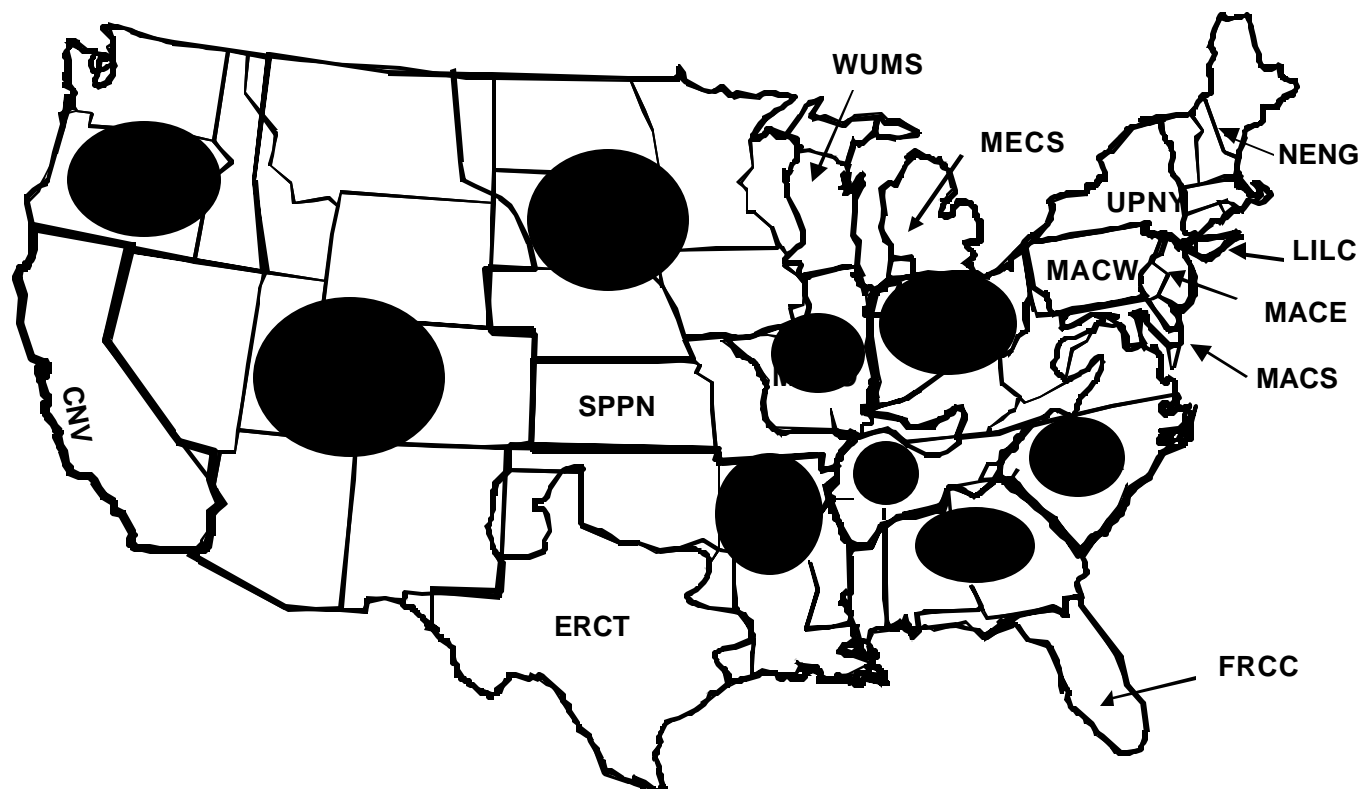
WRAP/AP2 Study Objectives

- ✍ Examine implications of renewable energy and energy efficiency goals for RH SO₂ program
- ✍ Economic assessment
 - Renewable energy mix
 - Cost implications
 - Emissions impacts
 - Regional economic impacts (employment, GRP, income)
- ✍ Individual state and tribal impacts

Analytic Framework

- ✍ Uses ICF's Integrated Planning Model (IPM™)
- ✍ E2 demand-side analysis done outside IPM
- ✍ Regional economic Impacts -- REMI model.
- ✍ IPM outputs will be used for visibility impact analysis

IPM[®] Model Regions



Renewables Dispatch in IPM

- ✍ Intermittent dispatch of wind and solar units is captured using seasonal generation profiles
- ✍ Reduced capacity credits for wind and solar captured through contribution to reserve margin
- ✍ Geothermal, landfill gas and biomass units based on economic dispatch
- ✍ Vintages of technologies modeled
- ✍ 10/20 goals implemented via a regional RPS requirement.

Key Assumptions

- ✍ Starting point: WRAP/MTF study
- ✍ Updated assumptions on renewable resources
- ✍ Baseline regulatory specifications
 - Annex Milestones/Cap and Trade
 - 1990 CAAA NO_x and SO₂ requirements
 - Northeast NO_x SIP CALL
- ✍ Transmission between regions explicitly modeled --
new lines can be constructed.

Wind Assumptions

Proposed Assumptions for Wind Supply Options				
Available Years	Wind Class	Capacity Factor	Overnight Capital Cost (2001\$/kW)	Fixed O&M Cost (2001 \$/kW-Yr)
2000-2009	6	40%	1000	24
2000-2009	5	35%	1000	22
2000-2009	4	30%	1000	19
2010-2030	6	46%	800	13
2010-2030	5	41%	885	12
2010-2030	4	36%	910	11

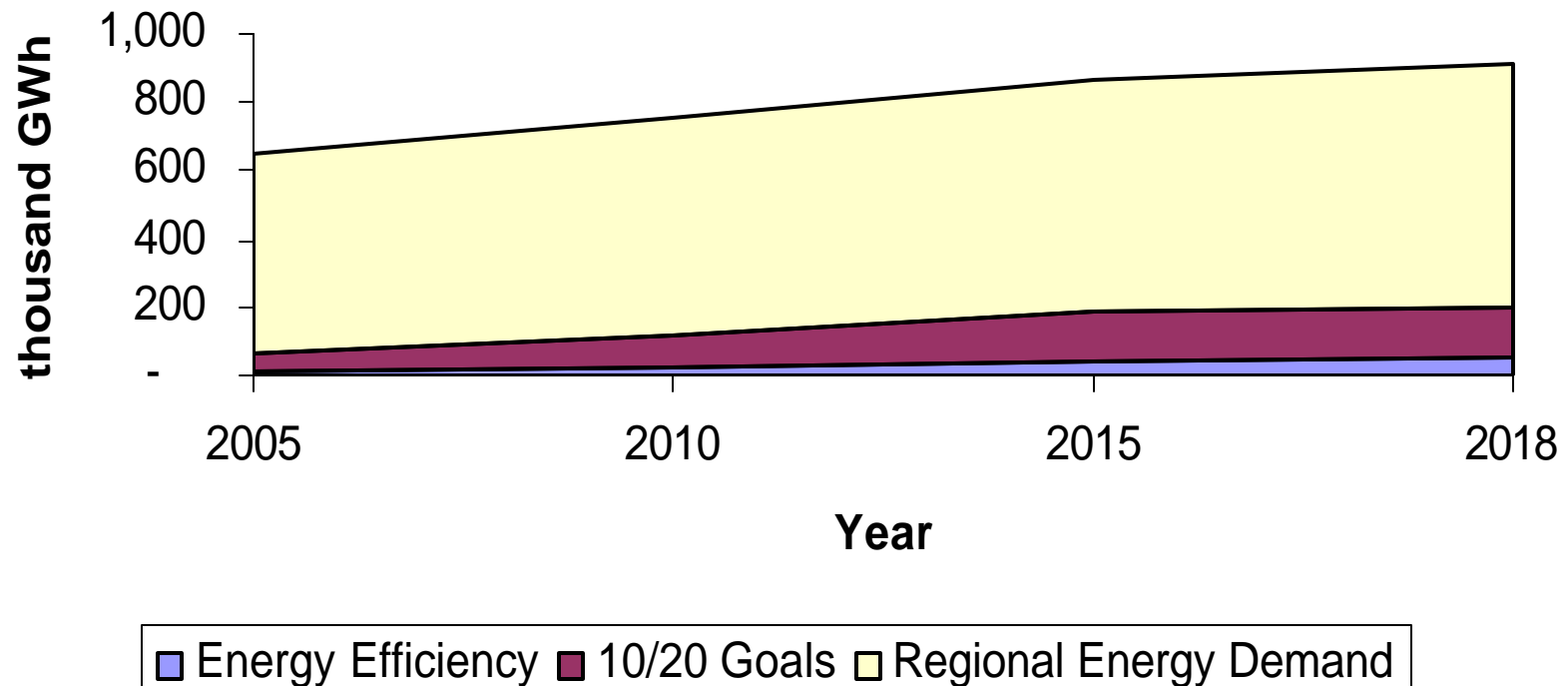
Wind Assumptions

- ✍ Methodology for capacity distribution by wind class and cost scalar based on Clean Energy Future study
 - Cost Scalar 1.0: Wind capacity meeting 10% of region's generation or 10% of available wind capacity, whichever is lower
 - Cost Scalar 1.2: 10% - 15% of region's generation
 - Cost Scalar 1.4: 15% - 20% of region's generation
 - Cost Scalar 1.6: Remaining wind capacity
- ✍ Lowest scalar first applied to available Class 6, then Class 5 and Class 4
- ✍ Transmissions costs added for interior west based on WGA transmission study

Selected Scenarios

- ✍ Regional SO₂ trading program and MTF renewables assumptions (no incremental renewables)
- ✍ SO₂ Trading Program with updated renewables assumptions (Core)
- ✍ Core Case with “10/20 goals” (10/20)
 - 10 percent of the GCVTC regional power needs by 2005
 - 20 percent of the regional power need by 2015.
- ✍ Core Case with 10/20 and energy efficiency (EE)

Targets for Energy Efficiency Recommendations and 10/20 Goals



Renewables Resource Penetration Under the Core

- ✍ About 15 GW of new wind capacity could be developed in the West by 2018 even without 10/20 goals based on the lower wind cost technology assumptions used here.
 - The growth in new wind capacity could displace approximately 9 GW of new fossil capacity by 2018
- ✍ Provides emission reductions and lowered compliance cost in meeting the 10/20 goals.
 - 68 billion kWh of wind generation in 2015 representing 50% of RPS requirement

Emissions Benefits of Increased Renewables and E2

- ✍ Renewables provide 1 % savings in NO_x (8 MTons) and a 10 percent savings in CO₂ (39 MMTonnes) in 2018
 - Relative to no renewables case/ SO₂ program is in place.
- ✍ Renewables/E2 reductions are about a 2.5% reduction in NO_x and 14 % savings in CO₂ in 2018
- ✍ Annex milestones of the regional SO₂ program are in place; thus, no projected SO₂ emissions reductions in the region.
 - They do reduce the trading price of SO₂ allowances.

Costs Implications

- ✍ Increased production costs from 10/20 in 2018 on the order of \$400 million relative to the Core Case where renewables penetrate.
- ✍ Wholesale price effects of 10/20 – reduced marginal price effects; premium required must be recovered.
- ✍ Production and Net Costs Savings due to energy efficiency are about \$1.6 billion.
- ✍ E2 reduces requirements of 10/20 goals.